

Investigation of Fatal Road traffic accidents in Libya

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ABSTRACT

There has been an exponential increase in road problems, risks, and traffic accidents in many nations worldwide. Fast and mandatory actions are required to avert road-related traffic accidents and hazards to guarantee safer, more efficient, and faster travel experiences. According to statistics 2010, a study conducted by Traffic Statistics at the Ministry of Public Safety (TSMPS) estimates the death of 6.5 people per day on Libya roadways. For this study the analyzing statistics on road Fatal Road traffic accidents in Libya in the years 2008-2012. Collect and investigate traffic accident data from statistics and information Office of General Traffic Department (GTD). The period for 2011 has been excluded from this study, for the reasons for the events that Libya witnessed during this period, and because the statistics of traffic accidents for the year 2011. Many reasons affected it and made its numbers very low, due to the closure of most traffic sections in the regions, traffic reduce, and the lack of vehicles on public roads. The research followed the descriptive analytical approach to the problem of road traffic accidents in Libya, and the use of the scientific engineering method to identify the factors affecting traffic safety, and to determine the availability of their requirements. Identify the main contributing factors affecting traffic accidents in road type segment. This aim of this study to statistical data on traffic accidents in Libya and identify the status of traffic safety on the roads. From available information,

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to search for the issue of the causes of accidents, and to reduce economic effects to raise the level of traffic safety in Libya as possible. This paper studies various factors and statistics related to road accidents that occurred in Libya. The goal of this reach is to identify the classification of traffic accidents on the roads; their causes, and the basis for analyzing traffic accident data, then will discuss the analysis of statistical data on traffic accidents in Libya. Vehicle accidents were found to be affected by many accidents factors reasons such as road design, vehicle issues, human perception, and more.

KEYWORDS: fatal, traffic accidents, statistical data, accidents factor.

التحقيق في حوادث المرور المميتة في ليبيا

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الملخص

هناك زيادة هائلة في مشاكل الطرق ومخاطرها من حيث حوادث المرور في العديد من الدول وجميع أنحاء العالم. والمطلوب اتخاذ إجراءات سريعة وإلزامية لتجنب الحوادث والمخاطر المرورية المتعلقة بالطرق لضمانه أكثر أمانًا وكفاءة في القيادة. وبحسب إحصائيات 2010، قدرت دراسة أجرتها مؤسسة الإحصاءات المرورية بوزارة السلامة العامة بليبيا (TSMPS) بان عدد الوفيات يقدر بـ 6.5 شخصًا يتوفوا يوميًا على الطرق بليبيا. وتهدف هذه الدراسة إلى تحليل إحصائيات الحوادث المميتة للطرق في ليبيا للأعوام 2008-2012. تجميع بيانات الحوادث المرورية من مكتب الإحصائيات والمعلومات بالإدارة العامة للمرور بليبيا (GTD). وقد تم استبعاد الفترة 2011 من هذه الدراسة، وذلك لأسباب الأحداث التي شهدتها ليبيا خلال هذه الفترة، لأن إحصائيات الحوادث المرورية

لعام 2011 لأسباب كثيرة أثرت على البيانات وجعلت أرقامها منخفضة للغاية، وذلك بسبب إغلاق معظم المكاتب المرورية في بعض المناطق، وانخفاض حركة المرور، وقلة المركبات على الطرق العامة. واستخدام المنهج الهندسي العلمي للتعرف على العوامل المؤثرة على السلامة المرورية، وتحديد مدى توفر متطلباتها. والتعرف على العوامل المساهمة الرئيسية التي تؤثر على الحوادث المرورية من جميع أنواع الطريق. وكما تهدف هذه الدراسة إلى الحصول على بيانات إحصائية عن حوادث المرور في ليبيا والتعرف على حالة السلامة المرورية على الطرقات من المعلومات المتوفرة، والبحث عن أسباب الحوادث، والتقليل من آثارها الاقتصادية لرفع مستوى السلامة المرورية في ليبيا قدر الإمكان والهدف من هذا هو الوصول إلى تصنيف حوادث المرور على الطرق؛ أسبابها، وأسس تحليل بيانات الحوادث المرورية، ومناقشة تحليل البيانات الإحصائية المتعلقة بالحوادث المرورية في ليبيا. فقد تبين أن حوادث المركبات تتأثر بالعديد من أسباب الحوادث مثل تصميم الطرق، ومشاكل المركبات، والإدراك البشري، وأكثر.

الكلمات المفتاحية: مميته، حوادث مرورية، بيانات إحصائية، عامل الحوادث

1- INTRODUCTION

More than 1.2 million lives are lost yearly due to road traffic injuries caused by vehicle collisions. These injuries are the leading cause of death among persons between the ages of 15 and 29 years worldwide (WHO, 2015). Accordingly, the ability to determine traffic accidents can help developers improve the road network. By improving the road network, developers can be able to keep the roads safe even with the continuous increase in traffic volume. For this study, road accident was investigated to order to identify and evaluate. Libya is the fourth largest state in the Africa. By area, with a total land mass of 679,362 square miles. In 2014, the population in Libya was estimated to be 6.3 million. Based on The Ministry of Communications and Transport Libya (MCTL 2012) the entire length of Libya -owned roads in 2012 is 51698 miles. Based on General Traffic Department (GTD 2012) in the year 2008, the total

number of traffic accidents in Libya was 11,548 with 2332 fatalities, 6424 seriously injured, and 7301 slightly injured.

2- BACKGROUND AND RELATED WORKS

2-1 Accident Factors

Traffic accidents that occur on the highway comprise of various interactions: human, environment, traffic, and roadway-related factors. As a result, the data collected on the causes of highway collisions is very complex. The improper evaluation may lead to biased recommendations. As a result, it requires a combination of several statistical approaches to address this unobserved heterogeneity. (Mannering, 2016)

2-1-1 Weather condition

Speed is the main factor when it comes to traffic accidents and suitable speed limits recommended for different weather conditions. The Highway Capacity Manual version 2000 recommends varied speed limits for both light and heavy snow weather conditions. For light snow conditions, the recommended speed is 110 km/h (68 mph), while a 70 km/h (43 mph) speed limit is recommended for heavy snow weather (Pisano, 2008). Seen as a risk factor for auto accidents, weather conditions affect visibility, tire-road friction, and speed as reported by Bergel. These researchers evaluated aggregate datasets of injury accidents in Dutch urban areas, France, and Athens over a period of more than 20 years. Their study revealed that the effect of weather variables had an impact on the total number of accident injuries. However, rain was the leading cause of accidents on France's interurban roads (Bergel, 2013). In addition, rain was the cause of many vehicle accidents. It was found that rainy weather conditions in the metropolitan area of Melbourne posed a threat to road safety. The rain affected various parameters over the 16-year study period (1987-2002). Rain imposed a driving hazard to road users and the risk was greater with a consistent availability of rain. Rainy conditions lead to more accidents than dry conditions (Keay, 2006).

2-1-2 Geometry design and speed

The road design also had an impact on traffic accidents. A case study in Juangsu Province, China evaluated the effect of the right exit ramp on single-lane freeway. Results indicated that to enhance both safety and road performance the best layout was the parallel-type single-lane exit (Xie, 2016). Design controls for curves are determined by establishing limits on the rate of super elevation (banking) and on the coefficient of side friction between tire and road (AASHTO, 1990). This observation implies that speed is a significant factor in an accident on horizontal curves, which can become an additional accident risk factor when traffic speeds exceed the ramp geometry (Troxel, 1994)(Zegeer, 1990)

2-1-3 Human error factor

Humans also play a role in the causation of accidents. Considering that humans operate vehicles, the interaction between environmental and human factors may result in accidents. A drivers' vision is considered a human factor and may play a part in road accidents. If the eye is functioning poorly, blurred vision is a risk factor for vehicle accidents in intersections, parking lots, and city streets (Mantjarvi, 1999)

In the same way, a drivers' age, gender, and educational level may affect the probability of accidents occurrences and other road safety violations. An analysis of a Dutch automobile database reported that male and female drivers do not differ in their participation in causing road accidents. However, younger drivers caused the highest number of collisions. Education level had no relationship with accident involvement (Lourens, 2015).

Driving under the influence of alcohol is probably the most common cause of accidents among the youth. In New Zealand, drunk driving was significantly associated with vehicle accidents. The drinking behavior causes drivers to engage in unsafe driving practices, which leads to accidents. Various countries across the globe have rules that punish drunken drivers (Horwood, 2000).

2-1-4 Time of day and type of accidents

The time of day when collisions occur depends on the amount of light available. In Illinois, David examined the safety differences between nighttime and daytime collisions during highway construction between 1996 and 2001. Study results indicate that lighting and weather conditions affected the frequency of fatal accidents occurring in work zones. The study noted that nighttime construction is more dangerous compared to daytime construction. However, the weather parameter was a limiting factor in the analysis affecting the results. Goel shared a similar view after the researcher collected four-years of road accident data. The study reported that most accidents take place during the day with non-work zone (61%) than at night (39%) in work zone (David, 2007).

Using the same data and a selected segment of the road discussed in the previous study, accident types and characteristics were evaluated. Head on/rear end collisions were caused mainly due to over speeding/driver's error and accounted for 46% of the accidents (Goel, 2016). Another study analyzed reports from 10 urban freeways in Texas during 1957.

The results revealed that of 498 ramp accidents:

82% were rear-ended impacts, 7% were sideswipe collisions, 6% involved collisions with fixed objects, The police reported more ramp-related accidents occur on freeways than any other freeway locations (Mullins, 1961).

3- METHODOLOGY

3-1 Data Collection

For this study, Libya road traffic accidents data were obtained from General Traffic Department (GTD). In this study, accident data from 2008 to 2012 on major Libya road were obtained from (GTD) report sheets. Then, data were cleaned and revised by removing missing values using SPSS version 23 software.

This data included the following elements: road condition, weather, light condition, type of accident of the accident's location. Table (1) shows the results indicate that the number of accidents associated

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vary from year to year. Most of the road accidents were located around intersections and highway interchanges. In the year 2008, the total number of road accidents in Libya was 11548 with 937 fatalities, 2332 seriously injured and 21 003 slightly injured. There were 7837 total accidents statewide in 2012 with 3020 fatalities, 5 234 seriously injured, and 5 003 slightly injured.

Table.1. Statewide total number of accidents in Libya from 2008-2012 (GTD, 2012)

Years	Total no. of accidents	Fatal	Seriously injured	Slightly injured
2008	11,548	1992	7611	6062
2009	13,664	1885	7123	4656
2010	13673	2301	6791	7338
2011	-	-	-	-
2012	7837	3020	3497	3632

Through this research, analyses were conducted for each year separately based on detailed accident data. Factors and parameters related to these accidents were evaluated. The number of accidents per study year is documented below in Figure 1.

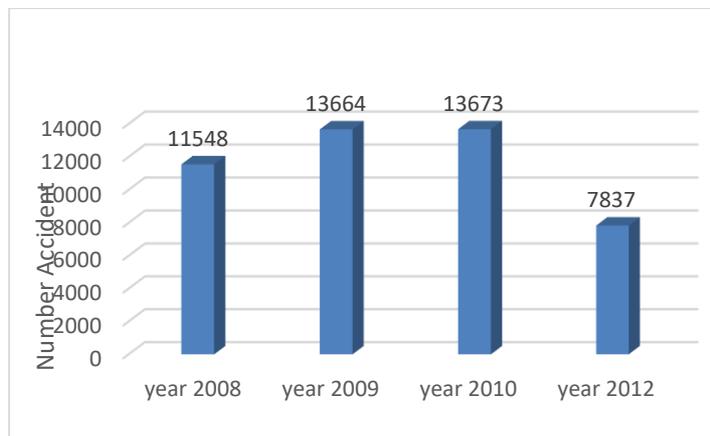


Figure 1: Number of accidents in Libya road years (2008 - 2012)

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3-2 Gender and Age

Distribution of causalities based on gender is shown in table (2) below. The table (2) shows the between 2008 and 2012, the percentage of male causalities was 82.8% compared to 17.2% for females. For the remaining percentage, the gender was uncoded and had an error.

Table 2: Number of fatalities accident causalities by gender of 2008 to 2012

Year Gender	2008	2009	2010	2012	Total	Percent
Male	1960	1894	2049	2507	8410	82.8
females	372	407	450	513	1742	17.2
Total	2332	2301	2499	3020	10152	100

Table 3 shows the age distribution relative to accidents. Of the four categories of age groups, the percentage of accident causalities for ages ≤ 18 Years was 13.9%, ages 19 - 20 was 9.2%, ages 21 - 24 was 13.5%, and age 25 and older was 63.4%. The percentage of accident causalities for age 25 and older was the highest in all four categories.

Table 3: Number of fatalities accident causalities by age in the period from 2008 to 2012

Driver Age (Years)	2008	2009	2010	2012	Total	Percent
≤ 18 Years	292	304	362	473	1069	13.9
19-20	216	203	225	283	702	9.2
21-24	349	303	323	378	1030	13.5
≥ 25 Years	1475	1491	1589	1886	4852	63.4
Total	2332	2301	2499	3020	7653	100

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3-3 Crash and Lighting

Table 4 shows the distribution of accidents along the lighting condition for different light condition. For the two light condition categories of daylight and dark lighted, the percentage of daylight was 59.2%, and the percentage of dark lighted was 40.8%.

Table 4: Fatalities accidents relative to daylight and dark light conditions

Time/Years	2008	2009	2010	2012	Total	Percent
Daylight	1150	1170	1116	1316	3602	59.2
Dark light	654	715	876	1034	2625	40.8
Total	1804	1885	1992	2350	6227	100

3-4. Classification or Types of Roads

There are many types of accidents that include local streets, collector roads, arterials, highways, freeways and rural roads. Table 5 categorizes by road type of the 10,152 accidents reported on types of roads between the years 2008 and 2012 in locations. Of those 10152accidents, 4149were categorized as main Roads for vehicle accidents.

Table 5: Fatalities accidents relative to types of roads and classification

Types of Roads Years	Rural Roads	Roads Sub	Main Roads	Highway	Local Streets	Total
2008	209	203	1078	496	346	2332
2009	209	170	1001	547	374	2301
2010	300	249	925	575	450	2499
2012	353	313	1145	691	518	3020

3-4. Accidents Causes

The causes of accidents for the location were registered in police reports. According to police reports, there were 11 causes of accidents from 2008 to 2012. The causes included speed limit, drunk, using dazzling light, vehicle conditions, pedestrian, signs,

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drivers' behavior, intersections, cell phone, and others. table 6 summarizes the number of accidents per cause per year.

Table 6: Causes for fatalities accidents over the road accidents location

Causes of accidents	2008	2009	2010	2012	Total	Percent
Drunk	29	32	32	47	140	1.7
Over speed limit	1167	1220	1289	1528	5204	64.8
Red light penetration	8	8	11	29	56	0.7
Using dazzling light at night	10	9	8	23	50	0.6
Tire and vehicle conditions	20	21	22	35	98	1.4
Pedestrian	88	93	98	118	397	4.9
Traffic light and signs	5	6	6	20	37	0.5
Drivers' behavior	221	143	240	360	1054	13
Intersections	18	20	20	25	83	1.0
Cell phone	2	2	2	28	34	0.4
Uncoded & errors	236	241	264	137	878	10.9
Total	3814	3805	4003	4362	8041	100

Based on the police reports, most of the accidents occurred when drivers were over speed limit. From 2008 to 2012, with 5204 accidents and the percentage (64.8%) were due to this Cause.

4- DISCUSSION

The predictor variables those were available for each vehicle collision that took place at the selected gender, age, driver error, distractions, lighting, time of day. There were 21510 vehicle accidents. Of which 9198 were fatal, 25022 were serious injuries, and

21688 were slight injuries from 2008 up to 2012. From the total of 8410 vehicle accidents that were fatal, almost all 8410 (%82.8) of them were responsible male drivers, and 1742 (17.2%) were female.

In addition, the 25-old group had the greatest increase in the fatality rate. The other three age groups, 21 to 24, 19 to 20, and under 18 had fewer accidents fatalities than the 25-old age groups among males. Of all accidents, 3602 (59.2%) occurred during Daylight, and the remaining 40.8% were registered in the Dark light. A total of 21510 vehicle accidents were also reported on main roads, which caused the deaths of 4149 persons accounting for 20%. A total of 14042 persons died due to road accidents on the other types of roads.

5- CONCLUSION

Human error seems to be the major cause in majority of vehicular accidents. Some of the examples contain using a mobile phone while driving a vehicle and ignoring red signs at traffic signals.

The heightening some of the common behavior of humans which results in an accident as: over speeding, drunken driving, pedestrian etc. Most fatal accidents occur due to over speeding or multiplying the risk of accident and severity of injury during an accident. Over speeding is one of the causes as fatal severity increases with collision speed as shown in this study.

Another significant cause for the alarming increase in the number of road accidents is driving vehicles in drunken conditions. Alcohol reduces concentration and the reaction time of the human body. It hinders vision due to dizziness. Alcohol drains fear and prompts humans to take risks. To reduce accidents, need to maintain vehicles as good brakes, lighting, tires, etc.

It is a common sight at road intersections that vehicles cross without caring for the light. The main motive behind red light jumping is saving time.

The number of fatalities driven by male drivers is always higher than that of female drivers in all age groups. This study indicated that drivers between 25 years and old were the most impacted by accidents.

The relationship between accident and road classes is seen to vary considerably and geographical areas. More importantly, having

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rules for these and other differences, the accident externality is shown to vary wildly with traffic flow.

Most accident studies do not differentiate between accidents occurring in daylight and at nighttime. However, driving conditions differ significantly between day and night by changing conditions, traffic patterns as well as driver manners, all affecting the accidents probability.

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